

U.S. Fish & Wildlife Service

Wetlands and Deepwater Habitats of Long Island, New York: Status 2004 - Results of the National Wetlands Inventory



Front and back cover photos by Andrea Pickerell.

Wetlands and Deepwater Habitats of Long Island, New York:
Status 2004 - Results of the National Wetlands Inventory

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Note: The findings and conclusions in the report are those of the author and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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Photo by Andrea Pickerell.

INTRODUCTION

Since the mid-1970s, the U.S. Fish and Wildlife Service (FWS) has been conducting a nationwide survey of wetlands and deepwater habitats through its National Wetlands Inventory Program (NWI). For the first 20-25 years, this survey was accomplished using traditional photointerpretation and cartographic techniques to produce map and digital geospatial data on the status of wetlands. Wetlands were interpreted on high-altitude (1:80,000) to mid-level (1:58,000-1:40,000) aerial photographs. Pen and ink overlays attached to the photos were used to record the findings (wetland classifications and boundaries). These data were then transferred to a standard 1:24,000 U.S. Geological Survey topographic map using a zoom transfer scope to produce a NWI map showing wetlands and deepwater habitats. Since the 1970s, advances in image analysis and cartographic technologies have led the NWI to change its mapping procedures. The NWI now performs “photointerpretation” (image analysis) directly on a computer screen using geographic information system (GIS) technology. Wetland classifications and boundaries are entered directly into the computer as a geospatial data layer on digital aerial imagery. Wetlands are classified according to the FWS’s official wetland classification system (Cowardin et al. 1979). This system has been adopted as the national wetland classification standard by the Federal Geographic Data Committee (<http://www.fws.gov/stand/standards/wetlands.txt>) for reporting on wetland status and trends.

Wetland mapping has been completed for over 90% of the coterminous U.S., all of Hawaii, and 35% of Alaska. For the Northeast, wetland mapping has been completed for 12 of the 13 states in the region; all but New York have been completely mapped. As time permits, the FWS summarizes the results of its NWI for geographic areas. Detailed state reports have been prepared for several states (Connecticut, Delaware, Rhode Island, Maryland, and New Jersey), while data summary reports have been prepared for most other states in the Northeast: Maine, Massachusetts, New Hampshire, Pennsylvania, Vermont, and West Virginia. NWI findings for the Northeast Region were summarized for each state based on wetland geospatial data available as of September 2009 (Tiner 2010).

Wetlands of Long Island, New York were initially mapped by NWI in the 1980s and updated for much of eastern Long Island in the 1990s. While the maps and geospatial data were available for public use, the acreage data were never summarized. In 2008, the NWI began updating the wetlands inventory for Long Island with 2004 imagery. This report provides a summary of the findings of the updated inventory. The report is the first of a few reports that will address Long Island wetlands. Other reports planned for publication in 2012 include a wetland characterization and functional assessment report and a report on Long Island wetland trends.

Study Area

Located in southeastern New York, Long Island is the longest and largest island in the coterminous United States (148th in the world; http://en.wikipedia.org/wiki/Long_Island). Its land area is greater than that of the state of Rhode Island. The island is 118 miles long and 23 miles wide at its widest point, beginning at New York Harbor and extending eastward to Montauk Point. It is bordered on the north by Long Island Sound, on the south by the Atlantic Ocean, and separated from Manhattan Island and the Bronx by the East River (Figure 1). It encompasses over 1,400 square miles of land and over 1,700 square miles of water mostly coastal embayments including Great South Bay, Moriches Bay, Shinnecock Bay, Peconic Bay, and Gardiners Bay. From a natural vegetation standpoint, Long Island falls within the Eastern Broadleaf Forest (Oceanic) Province of Bailey's Ecoregions (Bailey 1995).

Politically, Long Island is comprised of four counties: Kings, Queens, Nassau, and Suffolk (Table 1). The western end of Long Island (made up of the first three counties and the western half of Suffolk County) is heavily populated. Kings County, more commonly referred to as Brooklyn, is the most densely populated county in New York and second-ranked in the country (<http://en.wikipedia.org/wiki/Brooklyn>). The eastern half of Suffolk County is less densely populated and contains significant amounts of open lands - agricultural lands, parkland, and forests (Figure 2). Although Fishers Island is politically part of Suffolk County, it is nearly 12 miles from the northern tip of Long Island and may be geographically viewed as a separate entity. Given this location, it was not initially included in the Long Island study area, but later added to provide a more complete accounting for Suffolk County.

Geologically, Long Island marks one of the southernmost advances of the last continental ice sheet and is largely comprised of terminal glacial moraines (e.g., the Ronkonkoma Moraine along the middle of the Island and south fork and Harbor Hill-Roanoke Point Moraine along the north shore) and sandy outwash plains. A number of ponds called "coastal ponds" have formed in depressions created where the large ice blocks were left on the land as the ice sheet retreated about 20,000 years ago. These ponds are particularly abundant along the north shore of Long Island between the Ronkonkoma and Harbor Hill moraines. Long Island's south shore marks the beginning of a long chain of coastal barrier islands formed along the Atlantic Ocean from New York through Florida. Large coastal lagoons (embayments) developed behind these islands (e.g., Jamaica Bay, South Oyster Bay, Great South Bay, Moriches Bay, Shinnecock Bay) and extensive tidal marshes have formed within many of these protected waters. Other tidal wetlands have formed along the shores of other bays including Great Peconic Bay, Gardiners Bay, Napeague Bay, Oyster Bay, and Huntington Bay. Due largely to its geologic history and soils, only a few rivers occur on the Island. The Peconic River is the Island's largest river and is the only one running west to east giving it a larger drainage area than other rivers such as the Connetquot and Carmans that flow north to south into Great South Bay or the Nissequogue that flows south to north into Long Island Sound.

Table 1. Long Island counties and their land and water area in square miles and population density. (Sources: Wikipedia at: <http://en.wikipedia.org> and Baruch College at: http://www.baruch.edu/nycdata/chapter01_files/sheet003.htm)

County	Land Area (% of total)	Water Area (% of total)	Total Area	Population Per Square Mile (2007)
Queens	109 (61%)	69 (39%)	178	20,783
Kings	71 (73%)	26 (27%)	97	35,803
Nassau	287 (63%)	166 (37%)	453	4,557
Suffolk	912 (38%)	1,461 (62%)	2,373	1,593

Figure 1. Long Island counties. Note: While Queens and Kings (Brooklyn) Counties are boroughs of New York City and sometimes excluded from what is called Long Island, they are included as part of Long Island for this study.

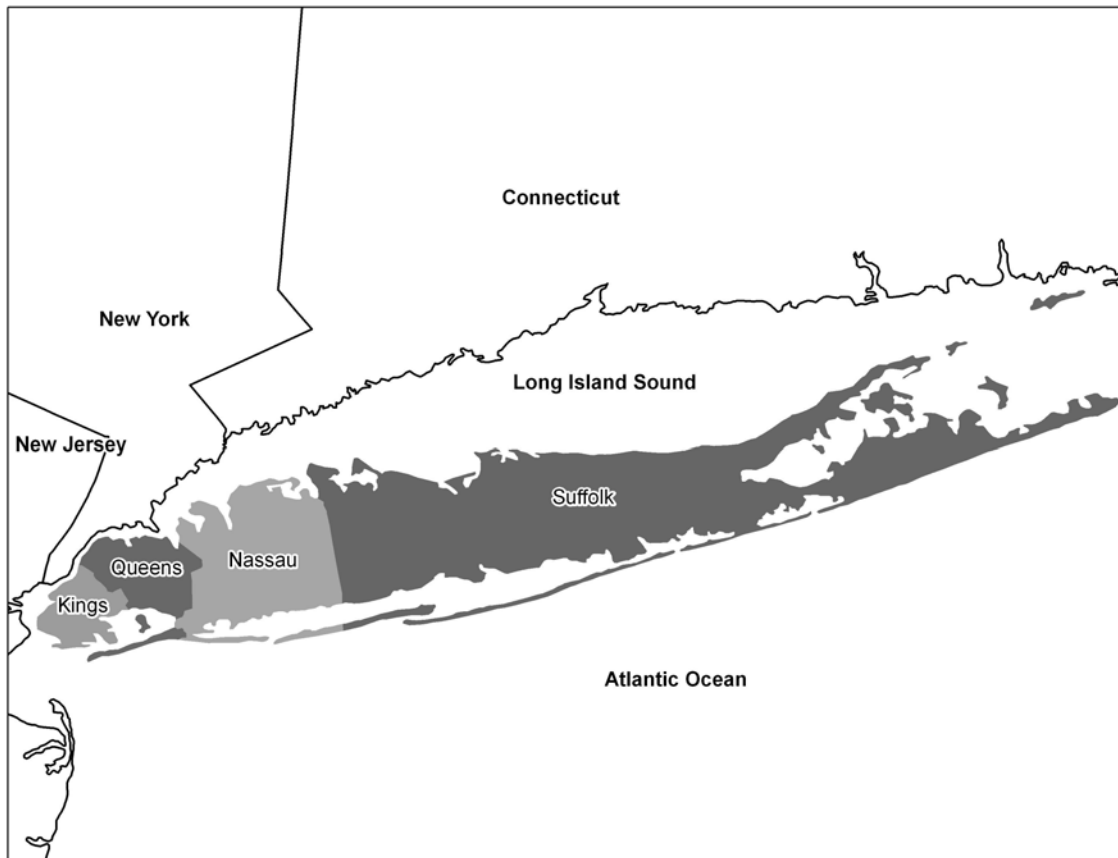
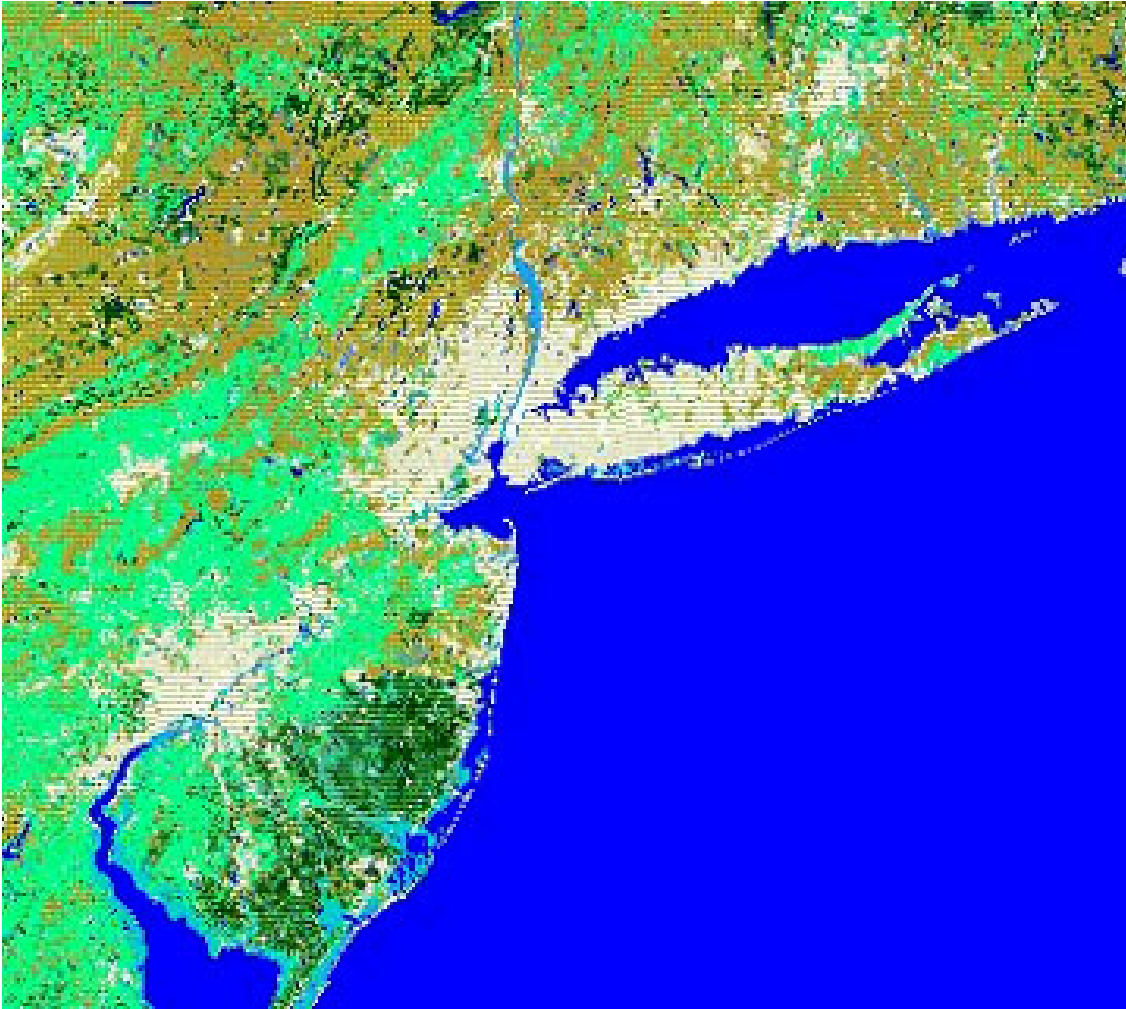


Figure 2. Land use and land cover for the New York Bight. Note: Dark green areas = pine forests, golden brown areas = deciduous forests, light green = agricultural lands, and white = urban and suburban development. (Source: U.S. Geological Survey: <http://3dparks.wr.usgs.gov/nyc/images/fig4.jpg>).



METHODS

The NWI relied on interpretation of aerial imagery (photographs and digital imagery) to locate and map wetlands and deepwater habitats. Image analysis and data compilation were performed by image and GIS analysts at Virginia Tech's Conservation Management Institute (Blacksburg, Virginia).

Source Imagery

For Kings, Queens, and Nassau Counties, the source imagery was 0.5-foot digital color infrared captured in the spring of 2004. For Suffolk County, the source imagery was 1-foot true color digital imagery also captured in the spring of 2004. Deciduous vegetation appeared in a leaf-off condition (K. McGuckin, pers. comm.). With this imagery, the target mapping unit for wetlands was 0.5 acres. This means that most wetlands larger than one-half acre should be mapped. However even with this target mapping unit established, it must be recognized that interpretation of aerial imagery has limitations in terms of the types of wetlands that can be readily identified (Tiner 1990, 1999) and that larger wetlands of certain types will escape detection and be missing from the maps in addition to smaller wetlands. These limitations are generally outlined in Table 2. Certain wetlands, especially ponds, are easy to identify, so ponds smaller than the target mapping unit may be identified. Image timing and quality is also a major factor affecting wetland interpretation, with leaf-off imagery during a normal wet spring, larger scale, and color infrared imagery being the best combination for wetland detection in the Northeast.

Collateral Data Sources

Several ancillary datasets were used to aid the interpreters in mapping wetlands. Collateral imagery included 1994 color infrared digital orthophoto quarter-quadrangle imagery from the U.S. Geological Survey. Older NWI data were used to identify previously detected wetlands. SSURGO soils data (<http://soildatamart.nrcs.usda.gov/>) were available for Nassau and Suffolk Counties and used to help verify wetlands with recognizable image signatures and to identify other areas that may be wetlands based on the presence of undeveloped hydric soils. Additionally, national elevation data (10m intervals) and digital raster graphic contour datasets (<http://seamless.usgs.gov/index.php>) were used to help identify possible wetlands or to exclude areas. Submerged aquatic vegetation datasets from the State of New York (<http://www.nysgis.state.ny.us/gisdata/inventories/member.cfm?organizationID=538>) and the NWI's previous work for the Peconic Estuary (Tiner et al. 2003) and for a portion of the North Fork (northeast portion of the Island; Tiner et al. 2007) were also incorporated into the wetland dataset for areas where these benthic habitats could not be located through photo interpretation.

Classification and Delineation

Wetlands were classified according to the FWS's official wetland classification system (Cowardin et al. 1979). The following categories were identified for wetlands and deepwater habitats: system, subsystem, class, subclass, water regime, and a few special modifiers (e.g., partly drained, dike/impounded, excavated, and farmed). The organic soil modifier "g" was applied to Atlantic white cedar swamps (e.g., PFO4Bg) to highlight them, while the acid modifier "a" was applied to bogs (e.g., PSS3Ba).

Wetlands and deepwater habitats were delineated and classified on-screen (i.e., by direct viewing of the imagery on a computer screen) using ESRI's ArcGIS 9.x. NWI geospatial data are posted on the web at the NWI home page: <http://www.fws.gov/wetlands/>. *Note: There are undoubtedly wetlands that escaped detection through our remotely sensed techniques due to their size, the lack of a photointerpretable signature, or other reasons.* People interested in locating wetlands for regulatory purposes are advised to also consult soil survey data available from the U.S. Department of Agriculture's web soil survey (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>) and to evaluate site-specific conditions (vegetation, soils, and hydrology) in accordance with applicable federal, state, and local requirements.

After interpreting wetlands based on the image signatures and reviewing collateral data sources, interpreters overlaid hydric soil data onto the imagery with the new NWI delineations. This allowed identification of undeveloped hydric soils that were not mapped as NWI wetlands - areas that did not possess a recognizable wetland signature on the imagery but may contain wetlands based on existing soil survey mapping. These areas were added to the geospatial database for the project and classified with the prefix "H" followed by a standard NWI code (e.g., HPFO1B) to indicate that these areas were identified by interpreting soil information. *Note: These data are not recorded in the national geospatial database (online) since it is not set up to deliver such data, but plans are being made to make these data available through other means.* In the meantime, the locations of these areas are displayed on the county wetland maps included in this report (i.e., white areas outlined in gray; best viewed at or near the true map scale). One can also consult the U.S. Department of Agriculture's online web soil survey (referenced above) for locations of hydric soils.

Data Analysis

NWI data were summarized by county and for the Island as a whole. Data were summarized using the ArcGIS Summarize Tool and imported into Microsoft's Excel. Figure 3 highlights the areas of the four counties and surrounding waters that were used to generate statistical summaries for this report. Any differences in Long Island and county totals are due to round-off procedures. Data for Fishers Island were similarly tabulated. County boundaries used for the summaries came from the State of New York (<http://www.nysgis.state.ny.us/gisdata/inventories/details.cfm?DSID=910>). The county and state boundaries are undefined across open water and in these areas the county boundaries were refined using the US Census Bureau's 2008 TIGER File county boundaries (<http://www2.census.gov/cgi-bin/shapefiles/national-files>).

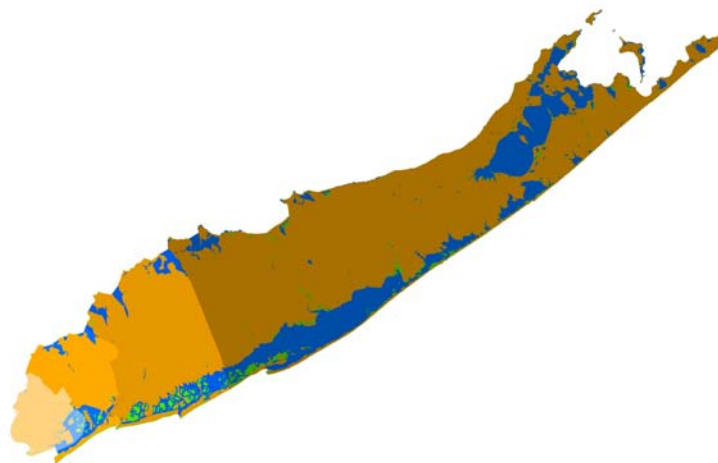


Figure 3. All colored areas represent land, wetlands, and water areas used to generate acreage summaries for Long Island and the four counties (except Fishers Island).

Map Production

A set of maps was prepared for this report for Long Island proper and each county. The scale varied due to the size of the county. One set shows the distribution of major types of wetlands and deepwater habitats, while another set displays areas that may contain wetlands based on the presence of undeveloped hydric soils. Custom maps showing the NWI wetlands may be produced for specific areas of interest via the internet using an online mapping tool - the Wetlands Mapper (<http://www.fws.gov/wetlands/Data/Mapper.html>).

Table 2. Major NWI map limitations. (Modified from Tiner 1999).

1. Target mapping unit – minimum size wetland that NWI is attempting to map which is generally related to the scale of the imagery: 0.5 acres for digital imagery used in the study area.
2. Spring photography – aquatic beds and nonpersistent emergent wetlands may be undermapped since these types are usually obscured by high water. In some cases, flooded emergents may be misclassified as scrub-shrub wetlands.
3. Forested wetlands – forested wetlands on glacial till are difficult to photointerpret as are temporarily flooded or seasonally saturated types, especially on the coastal plain and on glaciolacustrine plains; they may be underrepresented by the current NWI mapping. For the Long Island wetlands inventory, after interpreting wetlands, some undeveloped hydric soil mapping units remained; they were classified a “hydric soil wetlands” – areas

that may contain wetlands based on soil mapping. These “possible wetlands” are not in the NWI database since that database is not set up to handle such data, but the data are summarized in this report and the location of these areas are shown on the county wetland maps provided in this report.

4. Estuarine and tidal waters – delineation of the break between estuarine and riverine (tidal) systems should be considered approximate.
5. Tidal flats – since imagery was not tide-synchronized, tidal flat boundaries were based on aerial imagery.
6. Coastal wetlands – identification of high marsh (irregularly flooded) vs. low marsh (regularly flooded) in tidal marshes is conservative; photo-signatures are not distinctive in many instances.
7. Submerged aquatic beds – data came from a number of sources: actual interpretation of beds visible on the imagery combined with data from other sources (see “collateral data sources” discussion); the latter data were used where beds were not visible due to deepwater, waves, and sun glare.
8. Water regimes – water regime classification is based on image-signatures coupled with limited field verification; they should be considered approximate.
9. Linear wetlands (long, narrow) – they follow drainageways and stream corridors and may or may not be mapped depending on project objectives. Most NWI maps identify at least some of these features, but no attempt was made to map all of them.
10. Partly drained wetlands – they are conservatively mapped; many are not shown on NWI maps.
11. Drier-end wetlands (temporarily flooded and seasonally saturated types) – they are difficult to photointerpret; many have been mapped by consulting hydric soil data from the U.S.D.A. Natural Resources Conservation Service.
12. Mapped boundaries – they may be somewhat different than those based on detailed field observations, especially in areas with subtle changes in topography.

RESULTS

Wetland Geospatial Data

Geospatial data for Long Island wetlands and deepwater habitats are available online at the NWI website: <http://www.fws.gov/wetlands/>. Digital NWI data can be downloaded for GIS applications and custom maps for specific areas can be made using an online mapping tool – the “Wetlands Mapper.” (Note: The unmapped hydric soil areas will not be posted on this site as only designated wetlands and deepwater habitats are included in this database. Plans are being made to post these data at another website.)

Wetland Maps

For this report, maps showing the distribution of general wetland types (vegetated and nonvegetated) and deepwater habitats have been prepared for Long Island proper and for each of the four counties: 1) Kings (Brooklyn), 2) Queens, 3) Nassau, and 4) Suffolk. Maps showing undeveloped hydric soil areas that were not mapped as wetland due to the lack of a “wet” signature on the aerial imagery were prepared for Nassau and Suffolk Counties. These areas may contain some wetlands in addition to upland (dry land). All the maps are included in the sections summarizing NWI findings for these geographic areas. Readers can enlarge the maps to get a closer view of wetlands in specific areas of interest; higher resolution (jpeg) images are available upon request (ralph_tiner@fws.gov).

Findings for Long Island

Wetlands. The NWI identified about 51,000 acres of wetlands¹, covering almost six percent of Long Island (Figure 4; Table 3). Marine wetlands represented 10 percent of the Island’s wetlands. Almost all of these wetlands were sandy intertidal ocean-front beaches (estuarine unconsolidated shores). Estuarine wetlands were the most abundant wetland type on the Island, totaling 32,100 acres and representing almost two-thirds (63%) of the Island’s wetland area. This is not surprising given the chain of barrier islands (e.g., Jones Beach Island, Fire Island, and Westhampton Beach) and coastal embayments (e.g., Jamaica Bay, South Oyster Bay, Great South Bay, and Shinnecock Bay) that form much of the Island’s southern shore. These features create conditions that favor the establishment of salt marshes and tidal flats. Emergent wetlands (salt and brackish marshes) were the most common estuarine wetland type (24,546 acres), accounting for 76 percent of the estuarine wetlands and 48 percent of the Island’s wetland acreage. Unconsolidated shore wetlands (tidal flats and beaches) were second-ranked among the estuarine wetlands, comprising about one-fifth of these wetlands. Over one-quarter (27%) of the Island’s wetland acreage was represented by palustrine (freshwater)

¹ If Fishers Island is included, the total wetland acreage for Long Island is 51,066.7 since Fishers Island contained 208.8 acres of wetlands: 66.5 estuarine acres (66.2 – emergent; 0.3 scrub-shrub) and 142.3 acres of palustrine wetlands (4.6 – aquatic bed; 32.6 – emergent; 33.4 – forested; 3.6 scrub-shrub; 68.1 – unconsolidated bottoms).

wetlands, totaling 13,588 acres. Forested wetlands (wooded swamps) were the dominant palustrine type with 6,749 acres inventoried. They represented half of the palustrine wetlands and 13 percent of the Island's wetland acreage. Unconsolidated bottoms (ponds) were the second-ranked palustrine wetland type with 3,364 acres mapped. They accounted for one quarter of the palustrine wetlands or nearly seven percent of all wetlands. Nearly 2,000 acres of scrub-shrub wetlands and over 1,300 acres of emergent wetlands were inventoried. These two types represent approximately 15 percent and 10 percent of the palustrine wetland acreage, respectively.

Another 5,517 acres of "hydric soil map units" were identified supporting "natural vegetation" based on examination of the 2004 imagery (Figure 5). These areas were mapped as hydric soils (potential wetlands) by the U.S.D.A. Natural Resources Conservation Service in previous county soil surveys, but they did not exhibit a reliable "wet" signature on the 2004 imagery and were therefore not classified as wetland for purposes of the NWI work. Although these areas did not possess a wet photo-signature, they may contain some wetlands (see county maps for their locations).

Deepwater Habitats (excluding marine waters). Over 1.5 million acres of estuarine deepwater habitats were mapped in the study area which included part of Long Island Sound. About 2,670 acres of lacustrine waters were located during the survey. Submerged aquatic beds were found in the marine, estuarine and lacustrine waters (151 acres, 30,570 acres, and 20 acres, respectively). Only 54 acres of free-flowing riverine waters were inventoried. Most of the Island's rivers have been impounded creating standing water bodies (lakes or ponds).²

² These former rivers were classified as lacustrine waters (L1UBHh) or palustrine unconsolidated bottoms (PUBHh) depending on their size; if 20 acres or greater, they were mapped as L1UBHh and if smaller as PUBHh.

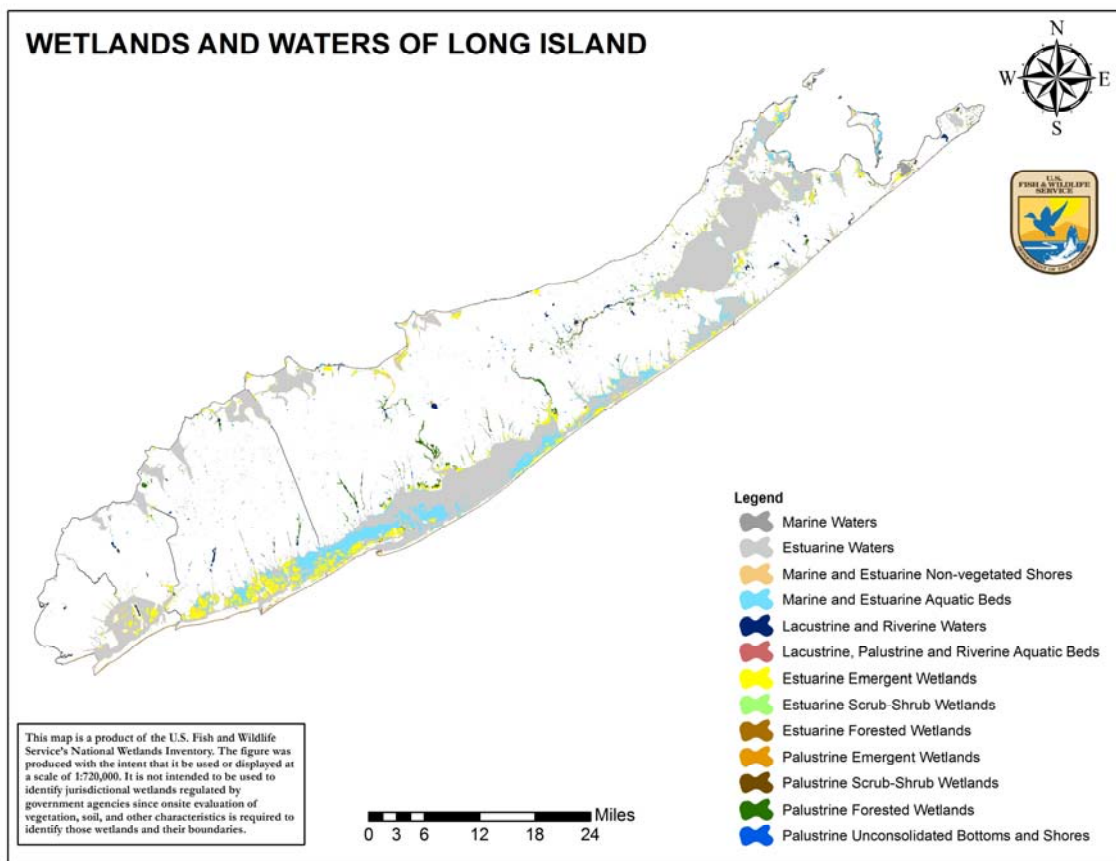


Figure 4. Map showing wetlands and waters of Long Island as of 2004. Note: Fishers Island is not included.

Table 3. Wetland acreage summaries for Long Island. Note: Sum of county totals may differ from the acreages in this table due to computer round-off procedures; the 208.8 acres of wetland on Fishers Island are not included in this table (see footnote on page 9) .

System	Wetland Class (General NWI Code)	Acreage
Marine	Aquatic Bed (M2AB)	8.1
	Rocky Shore (M2RS)	0.8
	Unconsolidated Shore-sand (M2US2)	5,132.1
	Unconsolidated Shore-other (M2US_)	24.7
	Total Marine	5,165.7
Estuarine	Aquatic Bed (E2AB)	187.8
	Emergent (E2EM)	24,545.5
	Scrub-Shrub (E2SS)	1,070.4
	Forested (E2FO)	8.2
	<i>Subtotal Vegetated</i>	<i>(25,811.9)</i>
	Rocky Shore (E2RS)	0.8
	Unconsolidated Shore-sand (E2US2)	5,740.5
	Unconsolidated Shore-other (E2US_)	547.2
	<i>Subtotal Nonvegetated</i>	<i>(6,287.7)</i>
	Total Estuarine	32,099.6
Palustrine	Aquatic Bed (PAB)	59.4
	Emergent (PEM)	1,318.5
	Forested-deciduous (PFO1)	5,170.8
	Forested-evergreen (PFO4)	155.7
	Forested-mixed (PFO1/___ and PFO 4/___)	1,415.3
	Forested-dead	7.1
	Scrub-Shrub-deciduous (PSS1)	1,595.2
	Scrub-Shrub-evergreen (PSS3 or PSS4)	102.8
	Scrub-Shrub-mixed (PSS_/___)	293.9
	Farmed	19.7
	<i>Subtotal Vegetated</i>	<i>(10,138.4)</i>
	Unconsolidated Bottom (PUB)	3,363.9
	Unconsolidated Shore (PUS)	85.2
	<i>Subtotal Nonvegetated</i>	<i>(3,449.1)</i>
	Total Palustrine	13,587.5
Riverine	Aquatic Bed-nontidal (R2AB)	4.1
	Total Riverine	4.1
Lacustrine	Unconsolidated Bottom	1.0
	Total Lacustrine	1.0
ALL WETLANDS		50,857.9

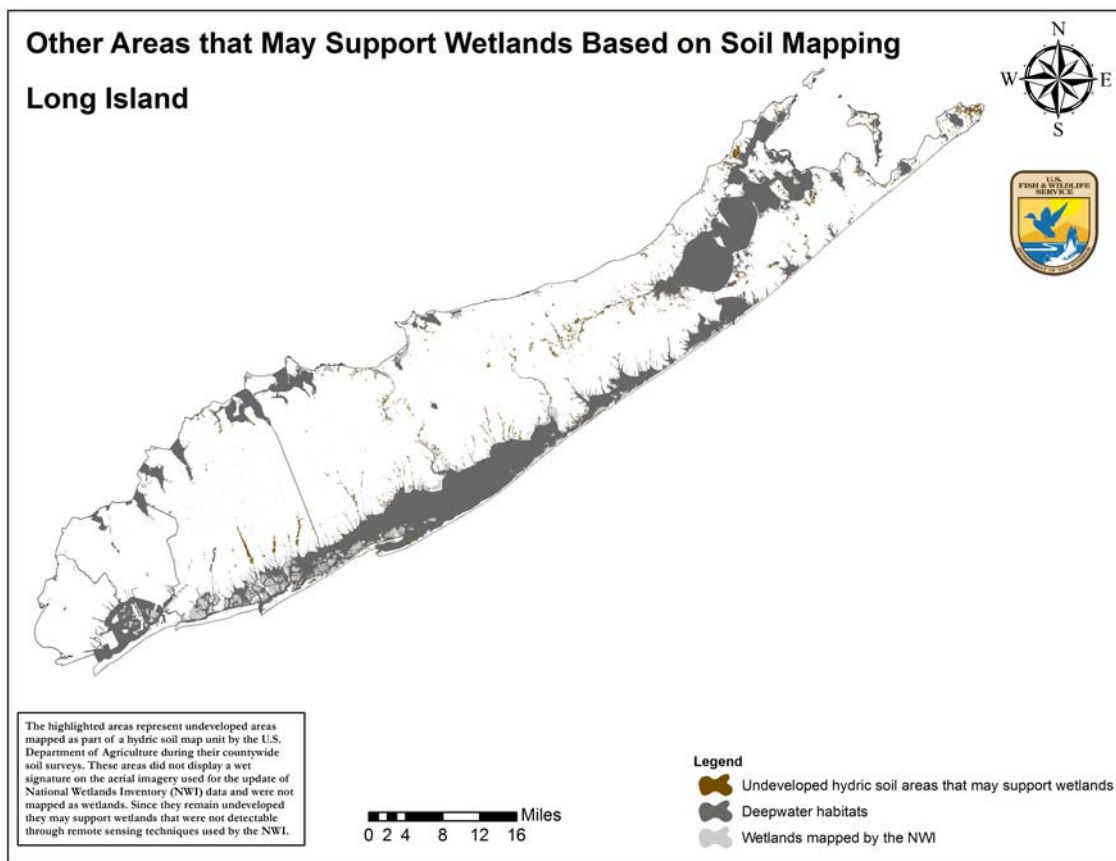


Figure 5. Map showing location of undeveloped hydric soil map units that may support wetlands. These areas contain undetermined amounts of wetland and/or upland.

Kings County

Wetlands. Wetlands occupied slightly more than 1,000 acres in Kings County, representing two percent of the county's land area (Table 4; Figure 6). Estuarine wetlands predominated, accounting for 82 percent of Kings County wetlands, with emergent types (salt and brackish marshes) being slightly more abundant than sandy unconsolidated shores (intertidal beaches). Marine wetlands made up 14 percent of the county's wetlands, with nearly 140 acres mapped. Palustrine wetlands comprised only 47 acres or five percent of the county's wetlands, with emergent types only slightly more abundant than scrub-shrub wetlands and unconsolidated bottoms (ponds).

Deepwater Habitats (excluding marine waters). Over 16,000 acres of estuarine deepwater habitats were inventoried for Kings County with 42 acres of subtidal aquatic beds associated with these waters. Only 45 acres of lacustrine waters were mapped and no riverine acres were found. (Note: Riverine waters consist of freshwater rivers and streams that are typically wider than 50 feet.)

Table 4. Wetland acreage summaries for Kings County, New York.

System	Wetland Class (General NWI Code)	Acreage
Marine	Unconsolidated Shore-sand (M2US2)	139.4
	Total Marine	139.4
Estuarine	Emergent (E2EM)	459.2
	Scrub-Shrub (E2SS)	15.1
	<i>Subtotal Vegetated</i>	<i>(474.3)</i>
	Unconsolidated Shore-sand (E2US2)	345.6
	Unconsolidated Shore-other (E2US_)	4.8
	<i>Subtotal Nonvegetated</i>	<i>(350.4)</i>
	Total Estuarine	824.7
Palustrine	Emergent (PEM)	17.0
	Scrub-Shrub-deciduous (PSS1)	16.2
	<i>Subtotal Vegetated</i>	<i>(33.2)</i>
	Unconsolidated Bottom (PUB)	14.0
	Total Palustrine	47.2
ALL WETLANDS		1,011.3

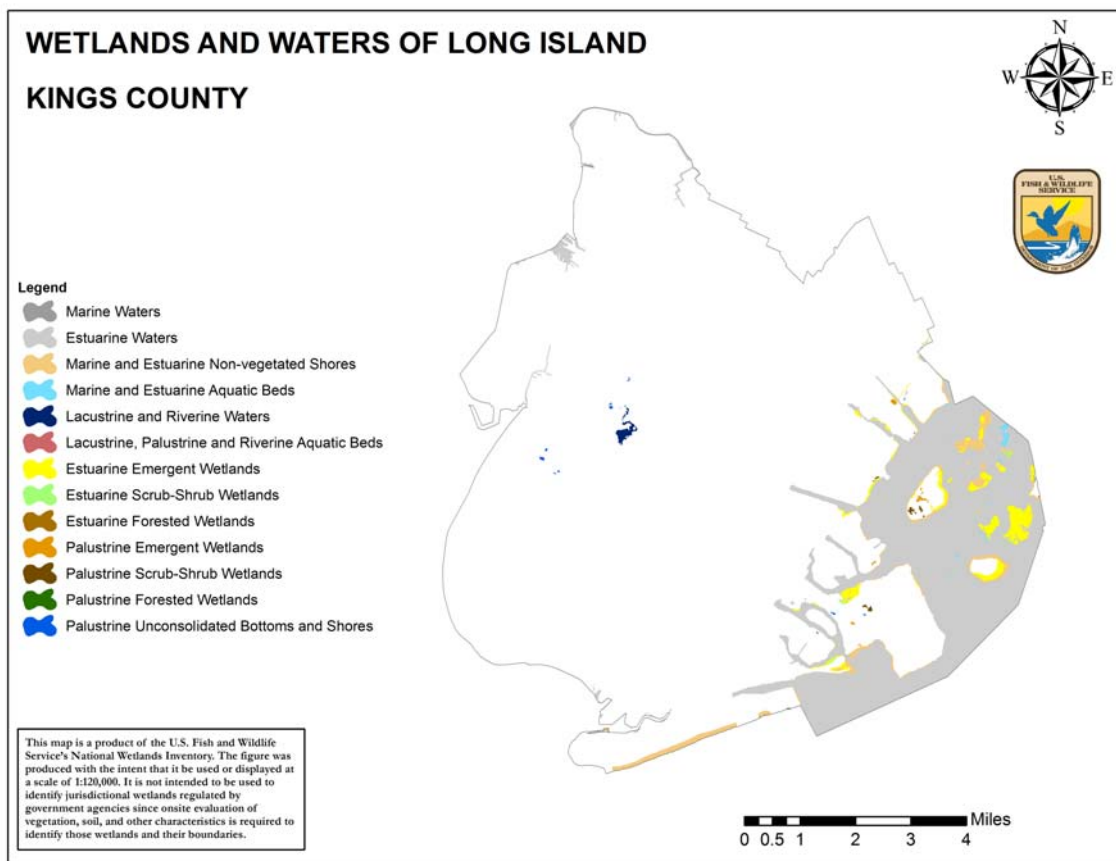


Figure 6. Wetlands and waters of Kings County as of 2004.

Queens County

Wetlands. Over 2,700 acres of wetlands were mapped in Queens County (Table 5; Figure 7). This acreage occupied nearly four percent of the county's land area. Almost 600 acres of marine sandy unconsolidated shores (intertidal beaches) were inventoried, accounting for about 22 percent of the county's wetlands. Estuarine wetlands were the predominant wetland type, totaling slightly more than 1,800 acres. These wetlands represented two-thirds of the county's wetlands. Emergent wetlands (salt marshes) alone comprised 75 percent of the estuarine wetlands and made up 49 percent of all wetlands. Almost 360 acres of estuarine unconsolidated shores (mostly sandy beaches) were mapped. Palustrine (freshwater) wetlands were limited to 323 acres, mostly emergent wetlands (marshes and wet meadows; 39% of palustrine wetlands) and unconsolidated bottoms (ponds; 36%). (Note: One acre of undeveloped hydric soil that did not possess a wet signature on the imagery was identified. It is too small to represent on a county map.)

Deepwater Habitats (excluding marine waters). Nearly 103,000 acres of estuarine waters were inventoried including 78 acres of submerged aquatic beds. A total of 282 acres of lacustrine waters and six acres of riverine acres were mapped. (Note: Riverine waters consist of freshwater rivers and streams that are typically wider than 50 feet.)

Table 5. Wetland acreage summaries for Queens County, New York.

System	Wetland Class (General NWI Code)	Acreage
Marine	Unconsolidated Shore-sand (M2US2)	599.3
	<i>Total Marine</i>	599.3
Estuarine	Emergent (E2EM)	1,349.1
	Scrub-Shrub (E2SS)	100.0
	<i>Subtotal Vegetated</i>	<i>(1,449.1)</i>
	Unconsolidated Shore-sand (E2US2)	337.3
	Unconsolidated Shore-other (E2US_)	22.6
	<i>Subtotal Nonvegetated</i>	<i>(359.9)</i>
	Total Estuarine	1,809.0
Palustrine	Emergent (PEM)	127.0
	Forested-deciduous (PFO1)	15.0
	Scrub-Shrub-deciduous (PSS1)	65.3
	<i>Subtotal Vegetated</i>	<i>(207.3)</i>
	Unconsolidated Bottom (PUB)	115.6
	Total Palustrine	322.9
ALL WETLANDS		2,731.2

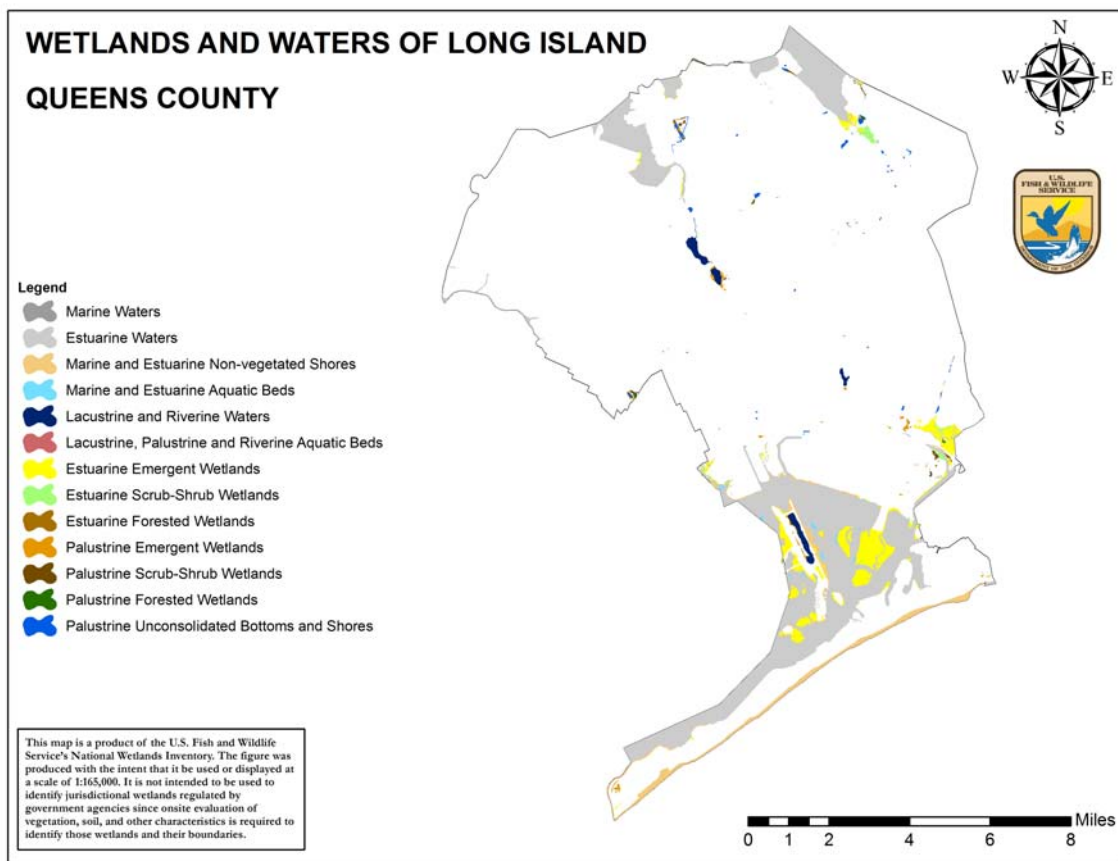


Figure 7. Wetlands and waters of Queens County as of 2004.

Nassau County

Wetlands. Over 13,500 acres of wetlands were mapped in Nassau County, covering about seven percent of the county's land area (Table 6; Figure 8). Estuarine wetlands predominated with nearly 10,500 acres present, representing 77 percent of the county's wetlands. Of these, estuarine emergent wetlands (salt and brackish marshes) were most abundant, accounting for 82 percent of the estuarine wetlands or 63 percent of all wetlands in the county. Fourteen percent of the estuarine wetlands were sandy unconsolidated shores (intertidal beaches). Palustrine wetlands (freshwater marshes, swamps, and ponds) only made up 15 percent of the county's wetlands, with forested wetlands being the most abundant vegetated type (820 acres or 40 percent of the palustrine wetlands), whereas unconsolidated bottoms (ponds) were slightly more abundant occupying about 861 acres (42 percent of the palustrine wetlands).

A total of 963 acres of undeveloped hydric soils were identified as "areas that may support wetlands based on soil mapping" (Figure 9). These areas did not have a reliable wet photo-signature and were not classified as wetland by this survey, but may contain some wetlands based on soil survey mapping by the U.S. Department of Agriculture.

Deepwater Habitats (excluding marine waters). Nearly 570,000 acres of estuarine deepwater habitats were inventoried within Nassau County including roughly 6,000 acres of submerged aquatic vegetation (6,022 acres). The remaining water acreage (436 acres) was represented by lacustrine waters (lakes, reservoirs, and deep ponds). No riverine waters were found. (Note: The channels of such waters would have to be greater than 50-feet wide in order to be mapped.)

Table 6. Wetland acreage summaries for Nassau County, New York.

System	Wetland Class (General NWI Code)	Acreage
Marine	Unconsolidated Shore-sand (M2US2)	1,024.5
	Total Marine	1,024.5
Estuarine	Aquatic Bed (E2AB)	131.0
	Emergent (E2EM)	8,553.3
	Scrub-Shrub (E2SS)	221.5
	Forested (E2FO)	0.1
	<i>Subtotal Vegetated</i>	<i>(8,905.9)</i>
	Unconsolidated Shore-sand (E2US2)	1,490.5
	Unconsolidated Shore-other (E2US_)	32.7
	<i>Subtotal Nonvegetated</i>	<i>(1,523.2)</i>
	Total Estuarine	10,429.1
Palustrine	Aquatic Bed (PAB)	10.5
	Emergent (PEM)	245.5
	Forested-deciduous (PFO1)	767.4
	Forested-evergreen (PFO4)	27.2
	Forested-mixed (PFO1/4 and PFO4/1)	25.0
	Scrub-Shrub-deciduous (PSS1)	82.7
	Scrub-Shrub-evergreen (PSS3 or PSS4)	15.3
	<i>Subtotal Vegetated</i>	<i>(1,173.6)</i>
	Unconsolidated Bottom (PUB)	861.2
	Unconsolidated Shore (PUS)	36.0
	<i>Subtotal Nonvegetated</i>	<i>(897.2)</i>
	Total Palustrine	2,070.8
ALL WETLANDS		13,524.4

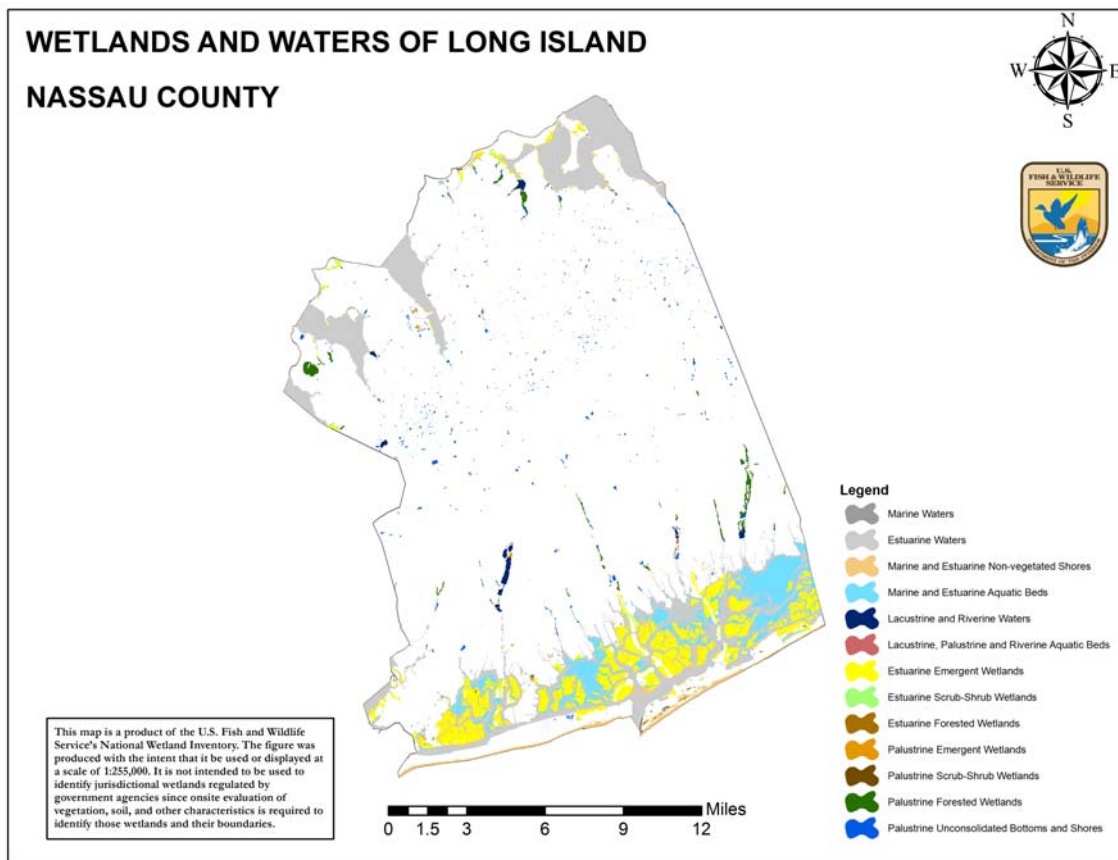


Figure 8. Wetlands and waters of Nassau County as of 2004.

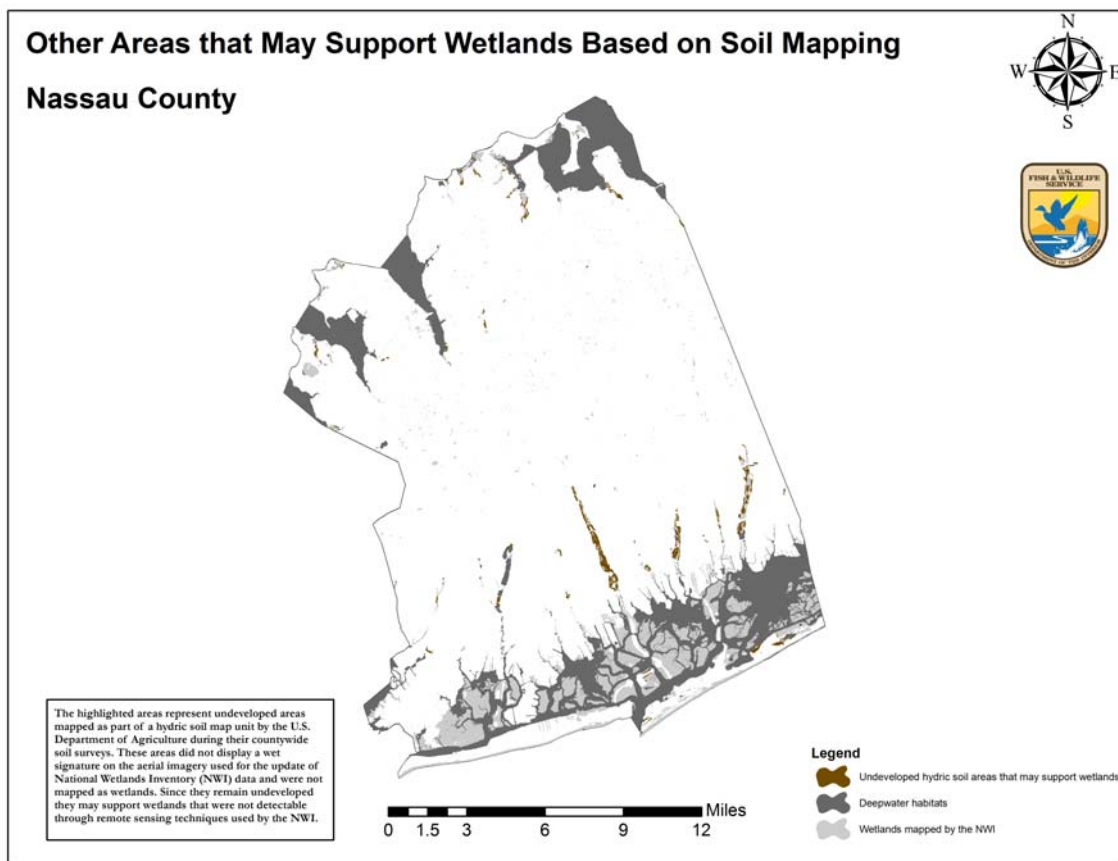


Figure 9. Map showing location of other areas in Nassau County that may support wetlands based on soil mapping. These areas contain undetermined amounts of wetland and/or upland.

Suffolk County

Wetlands. A total of 33,590 acres of wetlands³ were mapped in Suffolk County, accounting for nearly six percent of the county's land area (Table 7; Figure 10). Over half of the wetlands (57 percent) of the wetlands were estuarine types, of which 75 percent were emergent wetlands (salt and brackish marshes) and 19 percent were sandy unconsolidated shores (intertidal beaches) along estuarine waters. About 3,400 acres of marine wetlands were mapped and almost this entire acreage was represented by sandy unconsolidated shores (intertidal beaches). Palustrine wetlands accounted for one-third of the county's wetlands, with forested wetlands predominating (5,914 acres and 53 percent of the palustrine wetlands). Ponds were also quite abundant, occupying 2,422 acres (22 percent of the palustrine wetlands).

A total of 4,553 acres of undeveloped hydric soil was identified as "areas that may contain wetlands based on soil mapping" (Figure 11). These areas did not have a reliable wet photo-signature and were not classified as wetland by this survey, but may contain some wetland based on soil survey mapping by the U.S. Department of Agriculture.

Deepwater Habitats (excluding marine waters). Nearly 853,000 acres of estuarine deepwater habitats were inventoried for Suffolk County (including the south shore bays and Peconic Bay). Of these, 24,429 acres of aquatic beds were inventoried. Nearly 2,000 acres of lacustrine waters were inventoried (1,907 acres), with only 20 acres being aquatic beds. (Note: Mapping of freshwater aquatic beds was conservative due to the use of spring aerial imagery.) Riverine waters amounted to only 49 acres. While marine waters were not tabulated, 1,501 acres of marine aquatic beds were mapped (221 acres of algal beds, 447 acres of rooted vascular, and 833 acres of unspecified aquatic beds).

³ If Fishers Island is included, Suffolk County's total wetland area is 33,798.6 acres since Fishers Island contained 208.8 acres of wetlands: 66.5 estuarine acres (66.2 – emergent; 0.3 scrub-shrub) and 142.3 acres of palustrine wetlands (4.6 – aquatic bed; 32.6 – emergent; 33.4 – forested; 3.6 scrub-shrub; 68.1 – unconsolidated bottoms).

Table 7. Wetland acreage summaries for Suffolk County, New York.

System	Wetland Class (General NWI Code)	Acreage
Marine	Aquatic Bed (M2AB)	8.1
	Rocky Shore (M2RS)	0.8
	Unconsolidated Shore-sand (M2US2)	3,369.0
	Unconsolidated Shore-other (M2US_)	24.6
	Total Marine	3,402.5
Estuarine	Aquatic Bed (E2AB)	56.8
	Emergent (E2EM)	14,184.0
	Scrub-Shrub (E2SS)	733.8
	Forested (E2FO)	8.1
	<i>Subtotal Vegetated</i>	<i>(14,982.7)</i>
	Rocky Shore (E2RS)	0.8
	Unconsolidated Shore-sand (E2US2)	3,567.0
	Unconsolidated Shore-other (E2US_)	487.0
	<i>Subtotal Nonvegetated</i>	<i>(4,054.0)</i>
	Total Estuarine	19,036.7
Palustrine	Aquatic Bed (PAB)	48.9
	Emergent (PEM)	929.1
	Forested-deciduous (PFO1)	4,388.4
	Forested-evergreen (PFO4)	128.5
	Forested-mixed (PFO1/4 and PFO4/1)	1,390.2
	Forested-dead (PFO5)	7.1
	Scrub-Shrub-deciduous (PSS1)	1,685.4
	Scrub-Shrub-evergreen (PSS3 or PSS4)	127.0
	Farmed	19.7
	<i>Subtotal Vegetated</i>	<i>(8,724.3)</i>
	Unconsolidated Bottom (PUB)	2,373.0
	Unconsolidated Shore (PUS)	49.2
	<i>Subtotal Nonvegetated</i>	<i>(2,422.2)</i>
	Total Palustrine	11,146.5
Riverine	Aquatic Bed-nontidal (R2AB)	4.1
	Total Riverine	4.1
ALL WETLANDS		33,589.8

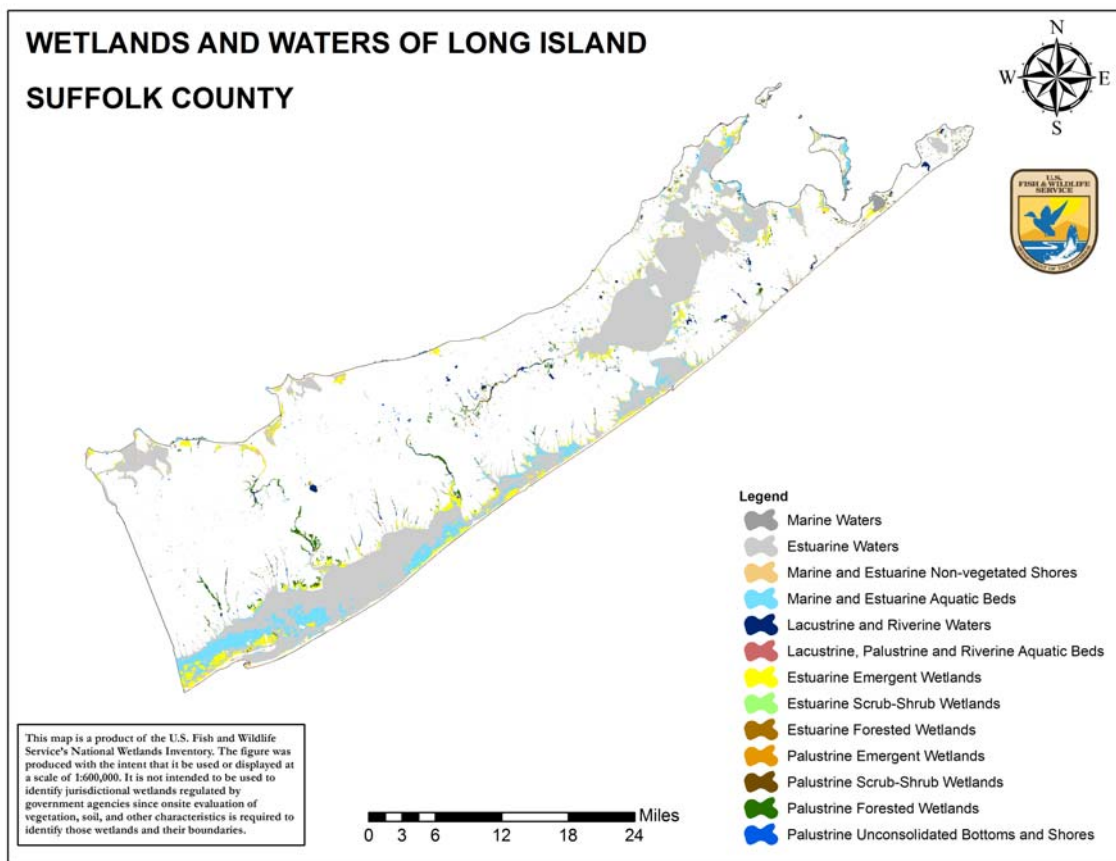


Figure 10. Wetlands and waters of Suffolk County as of 2004 (excluding Fishers Island).

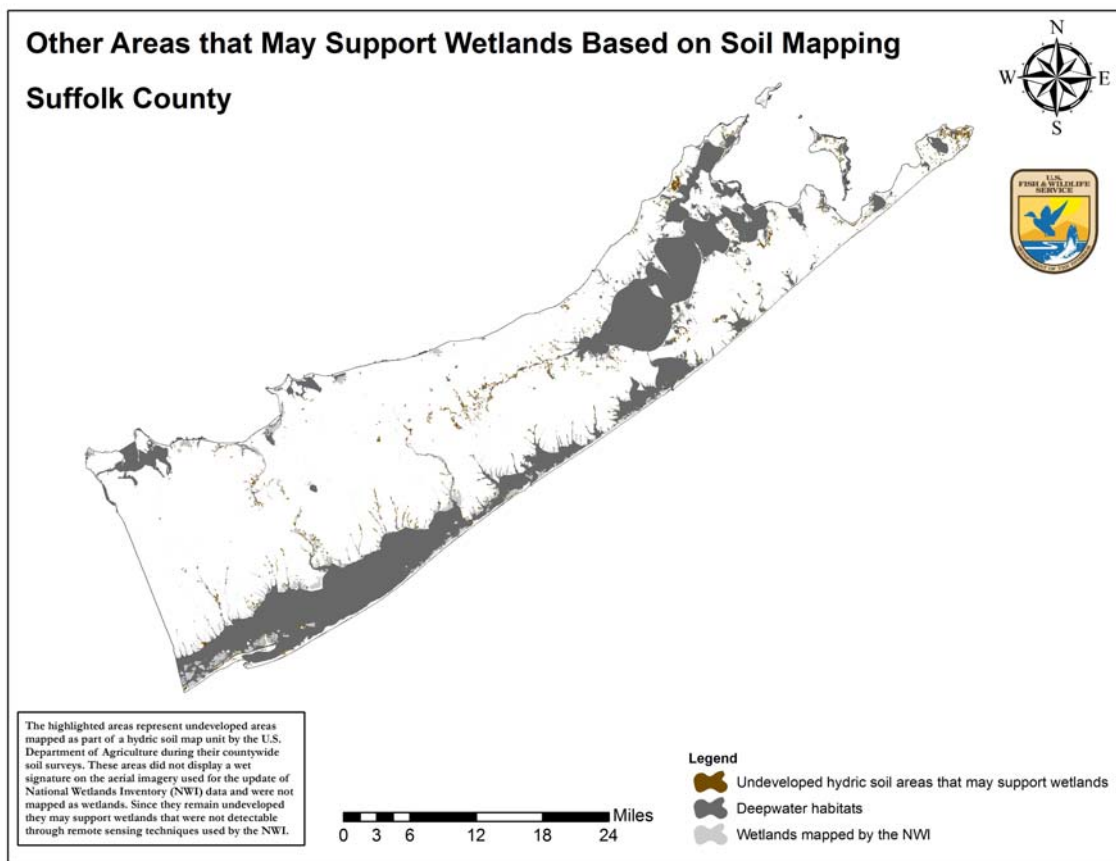


Figure 11. Map showing location of other areas in Suffolk County that may support wetlands based on soil mapping. These areas contain undetermined amounts of wetland and/or upland.

SUMMARY

Roughly 51,000 acres of wetlands were located on Long Island during the U.S. Fish and Wildlife Service's wetland inventory. Estuarine wetlands (mostly salt and brackish marshes and tidal flats/beaches) represented 63 percent of Long Island's wetlands, while freshwater types (mainly palustrine forested wetlands) accounted for 27 percent and marine wetlands (intertidal beaches) comprised the remaining 10 percent. Forested wetlands represented half of the Island's freshwater wetland acreage. Overall, six percent of Long Island's land area was occupied by wetlands. Fishers Island contained 209 acres of wetland, mostly freshwater types.

An additional 5,517 acres of undeveloped hydric soil areas may support some wetland. These vegetated areas were within hydric soil map units identified by the U.S.D.A. Natural Resources Conservation Service in previous county soil surveys, but did not exhibit a reliable "wet" signature on the imagery used for the NWI mapping. Consequently, they were not classified as wetland for purposes of this inventory. Since they may contain drier-end wetlands (e.g., seasonally saturated types) that are difficult-to-identify through image-analysis, they were considered worth highlighting for this inventory. Readers should be aware that these areas are not necessarily wetland and may be non-wetlands (dry land).

From the county standpoint, wetlands were most abundant in Suffolk County which is not surprising since this county encompasses two-thirds of Long Island. Suffolk County contained 66 percent of Long Island's marine wetlands, 59 percent of the estuarine wetlands, and 82 percent of the palustrine wetlands which in total comprised two-thirds of the Island's wetlands. Nassau County which comprised only 21 percent of Long Island's land area possessed 27 percent of the Island's wetlands. Of all the counties, it had the highest percentage of its land occupied by wetlands (7%). It was second-ranked in the acreage of marine wetlands (20% of these types for Long Island), estuarine wetlands (nearly one-third of the Island's salt and brackish wetlands), and palustrine wetlands (15% of the Island's freshwater wetlands). Five percent of Long Island's wetlands were mapped in Queens County and two percent in Kings County (Brooklyn). Non-marine waters followed the same trend as wetlands, with the greatest acreage in Suffolk County, followed by Nassau, Queens, and Kings Counties.

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